



Bird Community Monitoring at Lincoln Boyhood National Memorial, Indiana

Status Report

Natural Resource Data Series NPS/HTLN/NRDS—2015/999



ON THE COVER

Sign at entrance to Lincoln Boyhood National Memorial.
Photo from Heartland Network Files

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Natural Resource Data Series NPS/HTLN/NRDS—2015/999

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Abstract

Breeding bird surveys were initiated on Lincoln Boyhood National Memorial (LIBO), Indiana in 2007 to assess temporal changes in the species composition and abundance of birds on the park, and to improve our understanding of breeding bird – habitat relationships and the effects of management actions such as invasive plant species control on bird populations. Birds were sampled using point counts with 35 variable circular plots located on a systematic grid of 100 x 100 meter cells (originating from a random start point). All birds seen or heard on a plot during a 5-min sampling period were recorded. In the nine years since initiating our breeding bird survey, birds have been surveyed on the 35 variable circular plots in six of those years resulting in 122 plot visits. Surveys have yielded records for 52 different bird species. Fifty of the species recorded are classified as permanent or summer residents to the area. The remaining two species are classified as migrants through the area. Three species recorded are considered species of conservation concern for the Central Hardwoods Bird Conservation Region, the bird conservation region LIBO is located within.

Acknowledgment

We would like to thank the staff of Lincoln Boyhood National Memorial (LIBO), Indiana for allowing us access to the park during our breeding bird surveys. We would especially like to thank Paula Alexander for her coordination of surveys with volunteers. A debt of thanks is owed volunteer birders J.K. Thompson and A.R. Steeples for conducting many of the surveys on the park.

Introduction

Birds are an important component of park ecosystems, as their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems. It has been suggested that management activities, intended to preserve habitat for bird populations, such as for neo-tropical migrants, can have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991, Maurer 1993). Additionally, the National Park Service plays a role in bird conservation, as it complies with the requirements of the Migratory Bird Treaty Act of 1918 (as amended) and the Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. Moreover, birds have a tremendous following among the public and many parks provide information on the status and trends of birds through their interpretive programs. Bird monitoring is also critical as widespread habitat loss to agriculture and urban and industrial development threaten the integrity of the region for birds.

Lincoln Boyhood National Memorial (LIBO), Indiana is located in the Central Hardwoods Bird Conservation Region (Figure 1). The Central Hardwoods Bird Conservation Region is one of 67 regions identified in the North American Bird Conservation Initiative (NABCI). Started in 1999, the NABCI is a coalition of government agencies and private organizations in the United States working to ensure the long-term health of North America's native bird populations (NABCI 2015).

Lincoln Boyhood National Memorial lies in the Interior Low Plateaus section of the Central Hardwoods Bird Conservation Region (NABCI 2015). The area is dominated by an oak-hickory deciduous forest inhabited by interior forest species, such as Cerulean Warbler, Worm-eating Warbler, and Louisiana Waterthrush. The region includes some of the most extensive forests in the middle of the continent and is probably a source for populations of these birds for many surrounding areas. Threats to the region include deforestation for agriculture and urbanization. High priority birds of the region include Bald Eagle (*Haliaeetus leucocephalus*), Peregrine Falcon (*Falco peregrinus*), Black Rail (*Laterallus jamaicensis*), Whip-poor-will (*Caprimulgus vociferus*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Loggerhead Shrike (*Lanius ludovicianus*), Bell's Vireo (*Vireo bellii*), Brown-headed Nuthatch (*Sitta pusilla*), Bewick's Wren (*Thryomanes bewickii*), Sedge Wren (*Cistothorus platensis*), Wood Thrush (*Hylocichla mustelina*), Blue-winged Warbler (*Vermivora pinus*), Prairie Warbler (*Dendroica discolor*), Cerulean Warbler (*Dendroica cerulea*), Worm-eating Warbler (*Helmitheros vermivorus*), Swainson's Warbler (*Limnothlypis swainsonii*), Kentucky Warbler (*Oporornis formosus*), Bachman's Sparrow (*Aimophila aestivalis*), Henslow's Sparrow (*Ammodramus henslowii*), and Painted Bunting (*Passerina ciris*); U.S. Fish and Wildlife Service 2008). Approximately 119 species of breeding birds can be found in the habitat of the Central Hardwoods around LIBO (Mumford and Keller 1984).

Data collected during the U.S. Geological Survey's annual North American Breeding Bird Surveys (BBS) between 1966 and 2013 indicate that a number of bird species breeding at LIBO show evidence of long-term population decline (Sauer et al. 2014). In fact, 43% of the species have populations reported to be in decline, with species such as the Chimney Swift (*Chaetura pelagica*), Common Grackle (*Quiscalus quiscula*), House Sparrow (*Passer domesticus*), and Northern Bobwhite (*Colinus virginianus*) declining at alarming rates.

Long-term trends in community composition and abundance of breeding bird populations provide one measure for assessing the ecological integrity and sustainability of a system. We will use trends in the composition and abundance of bird populations as long-term indicators of ecosystem integrity at LIBO. *Ecosystem integrity* is defined as the system's capability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats of the region (Karr and Dudley 1981). Research has demonstrated that birds serve as good indicators of changes in ecosystems (Cairns et al. 2004, Mallory et al. 2006, Wood et al. 2006). Therefore, changes in the numbers and composition of bird communities may reflect the result of management actions taken to restore and maintain the cultural landscape at LIBO.

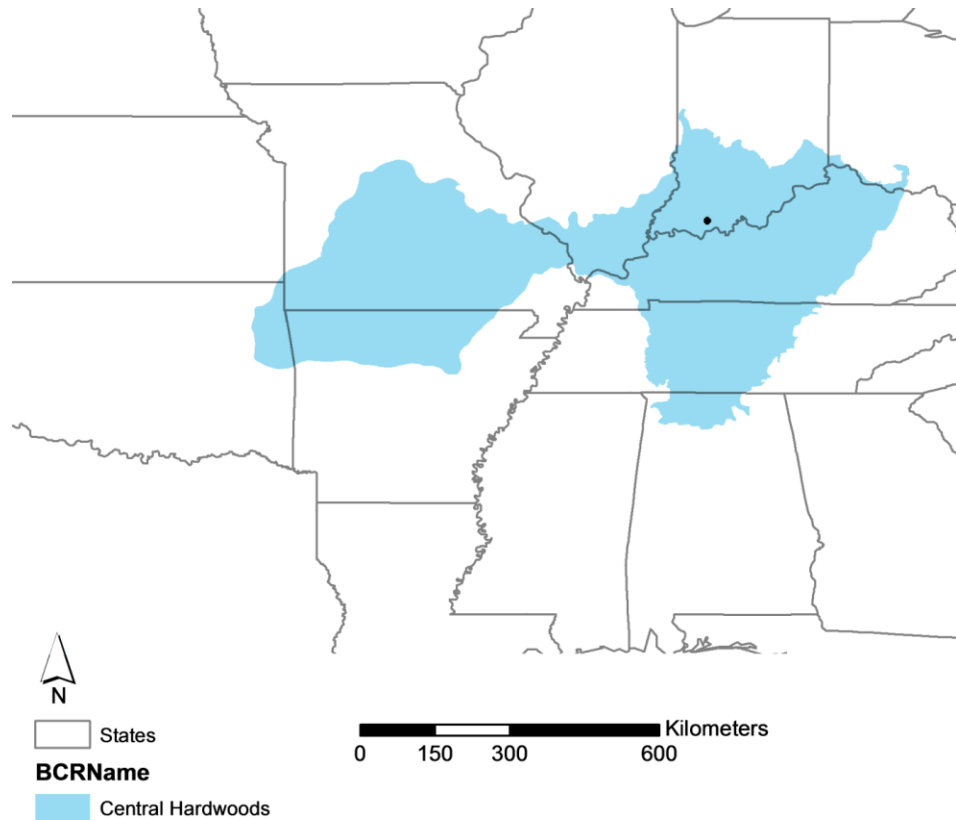


Figure 1. Location of Lincoln Boyhood National Memorial, Indiana within the Central Hardwoods Bird Conservation Region.

Objectives

There are three primary objectives for monitoring breeding birds at Lincoln Boyhood National Memorial:

- Identify significant temporal changes in the species composition and abundance of bird communities that occur at LIBO during the breeding season.
- Improve our understanding of breeding bird – habitat relationships and the effects of management actions such as invasive plant species control and timber stand thinning on bird populations, by correlating changes in bird community composition and abundance with changes in specific habitat variables (e.g., vegetation structure, ground cover).
- Make bird monitoring datasets for LIBO available to the avian conservation community and to the general public through the Avian Knowledge Network (AKN) and Data.Gov through the NPS Integrated Resource Management Applications (IRMA)

As a first step in meeting monitoring objectives, this report summarizes species composition and abundances for birds recorded during the six years of monitoring.

Methods

Site Selection

Permanent monitoring locations or 'plots' were selected by overlaying a systematic grid of 100 x 100 meter cells (originating from a random start point). The orientation of the grid was rotated 45 degrees to prevent monitoring sites from being influenced by man-made features (roads, fences, etc.) located along cardinal directions. We established 35 permanent plots on LIBO for monitoring bird population sizes and community composition (Figure 2). Monitoring occurred on one to 35 sites annually depending on year (Table 1).

Starting in 2012 breeding bird monitoring was conducted by volunteers in three out of the last four years, allowing annual data to be collected and HTLN to implement their modified sampling schedule for visiting the park once every fourth year.

Table 1. Number of plots sampled, and sampling dates for breeding bird surveys conducted at Lincoln Boyhood National Memorial, Indiana, by year. Also listed are observer(s) who conducted the surveys.

| Year | Sampling Dates | Number of Plots Sampled | Observer(s) |
|------|------------------|-------------------------|------------------------------|
| 2007 | June 9 – June 10 | 35 | D.G. Peitz* |
| 2011 | May 20 – May 21 | 35 | D.G. Peitz* |
| 2012 | June 16 | 1 | J.K. Thompson, A.R. Steeples |
| 2013 | April 8 | 8 | J.K. Thompson, A.R. Steeples |
| 2014 | May 1 | 8 | J.K. Thompson, A.R. Steeples |
| 2015 | May 15 – May 16 | 35 | D.G. Peitz* |

*Heartland I&M Network staff.

During bird surveys in 2007, 2011 and 2015, monitoring plots were located using navigation waypoints (Peitz et al. 2008) in a GPS unit and temporarily marked with 36-inch pin flags to aid in relocating the plots for habitat assessment, eliminating the need for permanent plot markers. We collected pin flags from each plot once the habitat work was completed. During bird surveys in other years when habitat assessments were not conducted, monitoring plots were located using a GPS unit. However, plot locations were not marked with pin flags.

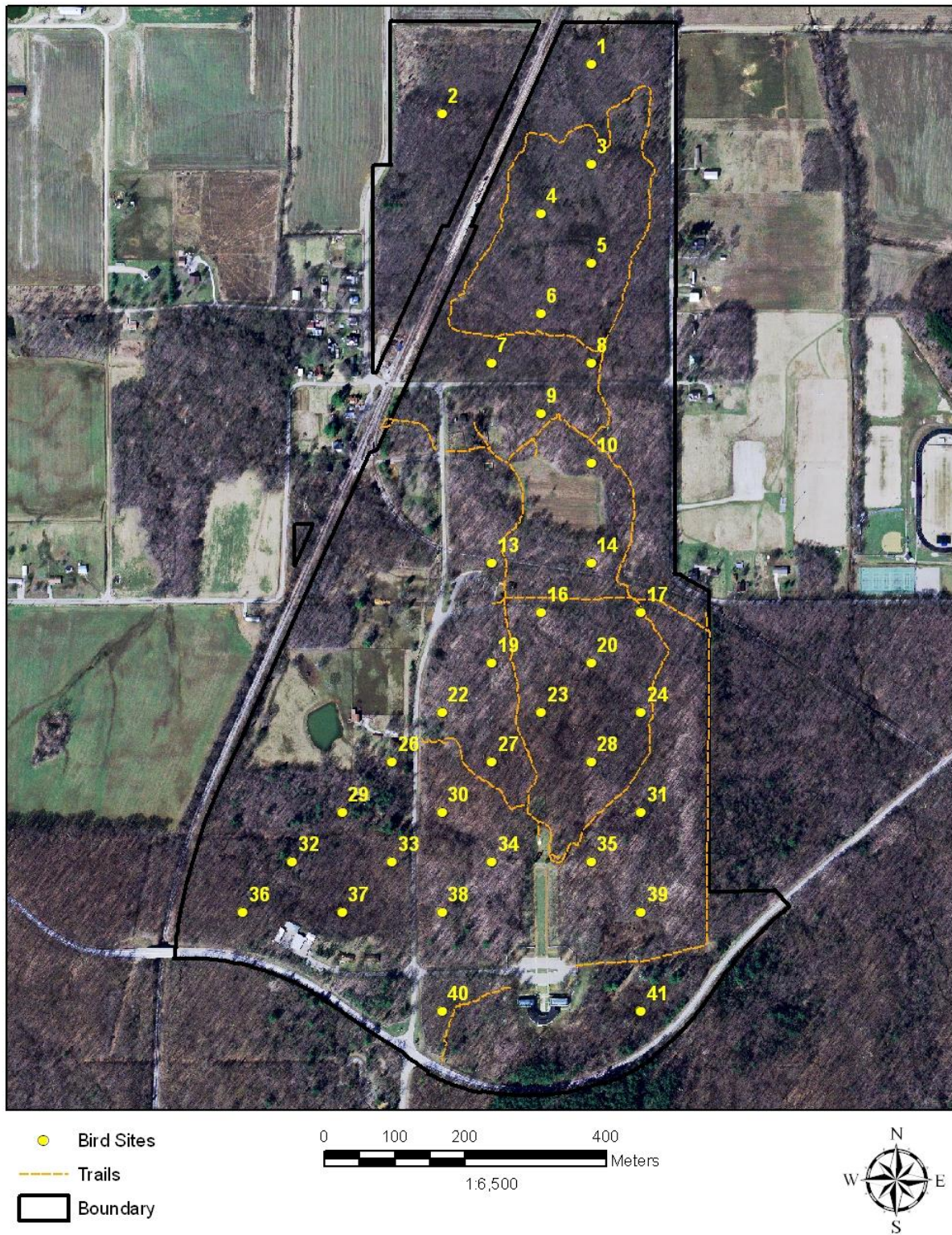


Figure 2. Bird plot locations on Lincoln Boyhood National Memorial, Indiana.

Bird Surveys

Bird surveys followed methods outlined in the bird monitoring protocol by Peitz et al. (2008) and summarized in this report. Variable circular plot counts, a point count methodology that incorporates a measure of detectability into population estimates, were used to survey birds present (Fancy 1997). All birds seen or heard at plots during 5-min sampling periods were recorded along with their corresponding distance from observer. For most species, we recorded each individual bird as a separate observation. For species that usually occur in clusters or flocks, the units recorded were cluster or flock size, and not the individual bird. During analysis, each individual in a cluster or flock was treated as a separate observation. After completing a count at a plot and filling out the data sheet, the observer navigated to the next plot using a GPS unit. While traveling between plots, the observer was vigilant for the presence of species not recorded during timed surveys. These species help formulate a more complete species list for the Memorial by identifying species missed during timed surveys. However, these observations were not included in any analysis as they did not directly relate to any individual plot. We sampled birds during a period when it was light enough to observe birds to four hours after sunrise.

Variable circular plot counts were conducted in an attempt to get an “instantaneous count” of all birds present. The observer recorded birds flushed from a plot when approached and the counts were started as soon as the observer reached plot center. We recorded all birds seen or heard, including flyovers, along with distance from the observer when possible. For this report, all birds seen or heard during the 5-min survey are included.

Data Analysis

Prior to summary analysis, the residency status (migrant, permanent resident, and summer resident) of each bird species recorded was determined. Identifying the residency of each species helps to exclude migrants from analysis of breeding birds within LIBO. Proportion of plots occupied by each bird species was calculated (total number of plots occupied by a species/plots surveyed) and reported in Appendix A. Park-wide abundances for each species are reported in Appendix A as well. Park-wide abundance was calculated by first deriving a species density from observations recorded within a 50-m radius (0.79 ha) around each plot center, and then calculating abundance based on the densities found within the area surveyed.

For this report we also obtained regional breeding bird trends for the Central Hardwoods Bird Conservation Region during the periods between 2007 and 2013 (Sauer et al. 2014), and reported these values for LIBO in Appendix B for comparison with populations on the park. The period between 2007 and 2013 roughly coincides with our breeding bird monitoring efforts.

Results

Bird Surveys

On LIBO breeding bird survey plots have been sampled in six of the nine year since initiating the study. During years of survey as many of the 35 variable circular plots as possible were sampled resulting in a total of 122 plot visits (Table 1). Fifty-two species were recorded during surveys (Table 2). Fifty of the 52 species recorded are classified as permanent or summer residents to the area (Mumford and Keller 1984). The two remaining species—Veery (*Catharus fuscescens*) and Yellow-rumped Warbler (*Setophaga coronata*)--are classified as migrants through the area.

On LIBO, three species recorded--Kentucky Warbler, Red-headed Woodpecker, and Wood Thrush--are considered species of conservation concern for the Central Hardwoods Bird Conservation Region (U.S. Fish and Wildlife Service 2008). American Robin (*Turdus migratorius*), Blue Jay (*Cyanocitta cristata*), Carolina Chickadee (*Poecile carolinensis*), Carolina Wren (*Thryothorus ludovicianus*), Northern Cardinal (*Cardinalis cardinalis*), Pileated Woodpecker (*Dryocopus pileatus*), Red-bellied Woodpecker (*Melanerpes carolinus*), and Tufted Titmouse (*Baeolophus bicolor*) are the most commonly encountered and widely distributed species on LIBO, annually (Appendix A). These eight species offer the best opportunities for monitoring the influence of changing habitats on bird species. For breeding species recorded on LIBO their trends within the larger Central Hardwoods Bird Conservation Region are reported in Appendix B for the period roughly coinciding with the surveys on LIBO.

Table 2. Bird species recorded during breeding bird surveys at Lincoln Boyhood National Memorial, Indiana in 2007 and 2011 through 2015. The American Ornithologists' Union Code (AOU code) and residency status of each species is given.

| Common name | Species name | AOU code | Residency ¹ |
|--------------------------|---------------------------------|----------|------------------------|
| Acadian Flycatcher | <i>Empidonax virens</i> | ACFL | SR |
| American Crow | <i>Corvus brachyrhynchos</i> | AMCR | R |
| American Robin | <i>Turdus migratorius</i> | AMRO | R |
| American Woodcock | <i>Scolopax minor</i> | AMWO | R |
| Baltimore Oriole | <i>Icterus galbula</i> | BAOR | SR |
| Blue-gray Gnatcatcher | <i>Poliophtila caerulea</i> | BGGN | SR |
| Blue Grosbeak* | <i>Passerina caerulea</i> | BLGR | SR |
| Blue Jay | <i>Cyanocitta cristata</i> | BLJA | R |
| Carolina Chickadee | <i>Poecile carolinensis</i> | CACH | R |
| Carolina Wren | <i>Thryothorus ludovicianus</i> | CARW | R |
| Chimney Swift | <i>Chaetura pelagica</i> | CHSW | SR |
| Common Grackle | <i>Quiscalus quiscula</i> | COGR | R |
| Downy Woodpecker | <i>Picoides pubescens</i> | DOWO | R |
| Eastern Bluebird | <i>Sialia sialis</i> | EABL | R |
| Eastern Phoebe | <i>Sayornis phoebe</i> | EAPH | SR |
| Eastern Towhee | <i>Pipilo erythrophthalmus</i> | EATO | R |
| Eastern Wood-pewee | <i>Contopus virens</i> | EAWP | SR |
| Gray Catbird | <i>Dumetella carolinensis</i> | GRCA | R |
| Great Crested Flycatcher | <i>Myiarchus crinitus</i> | GCFL | SR |

Table 2. Bird species recorded during breeding bird surveys at Lincoln Boyhood National Memorial, Indiana in 2007 and 2011 through 2015. The American Ornithologists' Union Code (AOU code) and residency status of each species is given (continued).

| Common name | Species name | AOU code | Residency ¹ |
|------------------------------|--|-------------|------------------------|
| Hairy Woodpecker | <i>Picoides villosus</i> | HAWO | R |
| House Sparrow | <i>Passer domesticus</i> | HOSP | R |
| House Wren | <i>Troglodytes aedon</i> | HOWR | SR |
| Indigo Bunting | <i>Passerina cyanea</i> | INBU | SR |
| Kentucky Warbler | <i>Geothlypis formosus</i> | KEWA | SR |
| Mourning Dove | <i>Zenaida macroura</i> | MODO | R |
| Northern Bobwhite | <i>Colinus virginianus</i> | NOBO | R |
| Northern Cardinal | <i>Cardinalis cardinalis</i> | NOCA | R |
| Northern Flicker | <i>Colaptes auratus</i> | YSFL | R |
| Northern Mockingbird | <i>Mimus polyglottos</i> | NOMO | R |
| Northern Parula | <i>Setophaga americana</i> | NOPA | SR |
| Ovenbird | <i>Seiurus aurocapillus</i> | OVEN | SR |
| Pileated Woodpecker | <i>Dryocopus pileatus</i> | PIWO | R |
| Prothonotary Warbler | <i>Protonotaria citrea</i> | PROW | SR |
| Red-bellied Woodpecker | <i>Melanerpes carolinus</i> | RBWO | R |
| Red-eyed Vireo | <i>Vireo olivaceus</i> | REVI | SR |
| Red-headed Woodpecker | <i>Melanerpes erythrocephalus</i> | RHWO | R |
| Red-tailed Hawk | <i>Buteo jamaicensis</i> | RTHA | R |
| Sharp-shinned Hawk | <i>Accipiter striatus</i> | SSHA | R |
| Song Sparrow | <i>Melospiza melodia</i> | SOSP | R |
| Summer Tanager | <i>Piranga rubra</i> | SUTA | SR |
| Tufted Titmouse | <i>Baeolophus bicolor</i> | TUTI | R |
| Turkey Vulture | <i>Cathartes aura</i> | TUVU | R |
| Veery | <i>Catharus fuscescens</i> | VEER | M |
| White-breasted Nuthatch | <i>Sitta carolinensis</i> | WBNU | R |
| White-eyed Vireo | <i>Vireo griseus</i> | WEVI | SR |
| Wild Turkey* | <i>Meleagris gallopavo</i> | WITU | R |
| Wood Thrush | <i>Hylocichla mustelina</i> | WOTH | SR |
| Yellow-billed Cuckoo | <i>Coccyzus americanus</i> | YBCU | SR |
| Yellow-rumped Warbler | <i>Setophaga coronata</i> | MYWA | M |
| Yellow-throated Vireo | <i>Vireo flavifrons</i> | YTVI | SR |
| Yellow-throated Warbler | <i>Setophaga dominica</i> | YTWA | SR |
| Yellow Warbler | <i>Setophaga petechia</i> | YWAR | SR |

* Species recorded only while traveling between point transects or at other times outside of 5-min survey periods.

¹ Residency: M = migrant; SR = summer resident; R = year around resident; According to Mumford and Keller (1984).

Species names are valid and verified names taken from ITIS (Integrated Taxonomic Information System). <http://www.itis.usda.gov/>.

Bolded species names are those species considered of conservation concern for the Central Hardwoods Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

Literature Cited

- Cairns Jr., J., P.V. McCormick and B.R. Niederlehner. 2004. A proposed framework for developing indicators of ecosystem health. [*Hydrobiologia* 263:1-44.](#)
- Fancy, S. G. 1997. A new approach for analyzing bird densities from variable circular-plot counts. *Pacific Science* 51:107-114.
- ITIS (Integrated Taxonomic Information System). Accessed 15 October 2015, <http://www.itis.usda.gov/>.
- Karr, J. R. 1991. Biological integrity: a long-neglected aspect of water resource management. *Ecological Applications* 1:66-84.
- Karr, J. R. and D. R. Dudley. 1981. Ecological perspective on water quality goals. *Environmental Management* 5:55-68.
- Mallory, M.L., H.G. Gilchrist, B.M. Braune and A.J. Gaston. 2006. Marine birds as indicators of arctic marine ecosystem health: linking the northern ecosystem initiative to long-term studies. [*Environmental Monitoring and Assessment* 113:31-48.](#)
- Maurer, B.A. 1993. Biological diversity, ecological integrity, and neotropical migrants: New perspectives for wildlife managers. Pages 24-31 in D.M. Finch and P.W. Stangel, editors. Status and management of neotropical migratory birds. U.S. Forest Service General Technical Report RM-229.
- Mumford, R.E. and C.E. Keller. 1984. *The Birds of Indiana*. Indiana University Press, Bloomington. 376pp.
- NABCI (North American Bird Conservation Initiative). Accessed 15 October 2015, <http://www.nabci-us.org/bcr23.html>.
- Peitz, D.G., G.A. Rowell, J.L. Haack, K.M. James, L.W. Morrison, and M.D. DeBacker. 2008. Breeding bird monitoring protocol for the Heartland Network Inventory and Monitoring Program. Natural Resource Report NPS/HTLN/NRR-2008/044. National Park Service, Fort Collins, Colorado. 152pp.
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2012. Version 01.30.2015* [*USGS Patuxent Wildlife Research Center, Laurel, MD.*](#)
- U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <<http://www.fws.gov/migratorybirds/>>]

Wood, J.K., N. Nur, C.A. Howell and G.R. Geupel. 2006. Overview of Cosumnes riparian bird study and recommendations for monitoring and management. A Report to the California Bay-Delta Authority Ecosystem Restoration Program. Petaluma, California.

Appendix A.

Appendix A. Annual proportion of plots occupied (includes flyovers) by, and estimated abundance (determined using bird within 50-m of plot center) of breeding bird species at Lincoln Boyhood National Memorial, Indiana during the 2007 and 2011 through 2015 spring bird surveys.

| Common name | <u>Proportion of plots occupied</u> | | | | | |
|-----------------------|-------------------------------------|--------------|-------------|-------------|-------------|--------------|
| | Abundance | | | | | |
| | 2007 n=35 | 2011 n=35 | 2012 n=1 | 2013 n=8 | 2014 n=8 | 2015 n=35 |
| Acadian Flycatcher | 0.06 | 0.09 | 0 | 0.03 | 0 | 0.03 |
| | 6 | 8 | 0 | *-- | 0 | 3 |
| American Crow | 0.23 | 0.20 | 0 | 0 | 0 | 0.06 |
| | 11 | 42 | 0 | 0 | 0 | 6 |
| American Robin | 0.06 | 0.03 | 1.00 | 0.06 | 0 | 0.09 |
| | 3 | 3 | -- | 25 | 0 | 3 |
| American Woodcock | 0.03 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 0 | 0 | 0 | 0 | 0 |
| Baltimore Oriole | 0 | 0.03 | 0 | 0 | 0 | 0 |
| | 0 | 3 | 0 | 0 | 0 | 0 |
| Blue-gray Gnatcatcher | 0.23 | 0.29 | 0 | 0 | 0 | 0.31 |
| | 17 | 20 | 0 | 0 | 0 | 31 |
| Blue Jay | 0.09 | 0.03 | 1.00 | 0.03 | 0.06 | 0.11 |
| | -- | -- | -- | 12 | 25 | -- |
| Carolina Chickadee | 0.09 | 0.09 | 0 | 0.11 | 0.06 | 0.06 |
| | 3 | 6 | 0 | 49 | 25 | 8 |
| Carolina Wren | 0.23 | 0.20 | 0 | 0.03 | 0.06 | 0.06 |
| | 3 | 14 | 0 | 25 | -- | 3 |
| Chimney Swift | 0.03 | 0 | 0 | 0 | 0 | 0.03 |
| | -- | 0 | 0 | 0 | 0 | -- |

Appendix A. Annual proportion of plots occupied (includes flyovers) by, and estimated abundance (determined using bird within 50-m of plot center) of breeding bird species at Lincoln Boyhood National Memorial, Indiana during the 2007 and 2011 through 2015 spring bird surveys.

| Common name | <u>Proportion of plots occupied</u> | | | | | |
|--------------------------|-------------------------------------|--------------|-------------|-------------|-------------|--------------|
| | Abundance | | | | | |
| | 2007 n=35 | 2011 n=35 | 2012 n=1 | 2013 n=8 | 2014 n=8 | 2015 n=35 |
| Common Grackle | 0.03 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 0 | 0 | 0 | 0 | 0 |
| Downy Woodpecker | 0 | 0 | 0 | 0.03 | 0 | 0.03 |
| | 0 | 0 | 0 | -- | 0 | 3 |
| Eastern Bluebird | 0 | 0 | 0 | 0 | 0.09 | 0 |
| | 0 | 0 | 0 | 0 | 37 | 0 |
| Eastern Phoebe | 0 | 0.03 | 0 | 0 | 0 | 0 |
| | 0 | -- | 0 | 0 | 0 | 0 |
| Eastern Towhee | 0.03 | 0 | 0 | 0.06 | 0.06 | 0.14 |
| | -- | 0 | 0 | 12 | 12 | 8 |
| Eastern Wood-pewee | 0.20 | 0.17 | 0 | 0 | 0 | 0.23 |
| | 11 | 6 | 0 | 0 | 0 | 6 |
| Gray Catbird | 0.06 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 0 | 0 | 0 | 0 | 0 |
| Great Crested Flycatcher | 0.11 | 0.29 | 0 | 0 | 0 | 0.11 |
| | 6 | 25 | 0 | 0 | 0 | 11 |
| Hairy Woodpecker | 0 | 0 | 0 | 0 | 0 | 0.03 |
| | 0 | 0 | 0 | 0 | 0 | 3 |
| House Sparrow | 0 | 0 | 0 | 0.03 | 0 | 0 |
| | 0 | 0 | 0 | 37 | 0 | 0 |
| House Wren | 0 | 0 | 0 | 0 | 0 | 0.03 |
| | 0 | 0 | 0 | 0 | 0 | 3 |

Appendix A. Annual proportion of plots occupied (includes flyovers) by, and estimated abundance (determined using bird within 50-m of plot center) of breeding bird species at Lincoln Boyhood National Memorial, Indiana during the 2007 and 2011 through 2015 spring bird surveys.

| Common name | <u>Proportion of plots occupied</u> | | | | | |
|-------------------------|-------------------------------------|--------------|-------------|-------------|-------------|--------------|
| | Abundance | | | | | |
| | 2007 n=35 | 2011 n=35 | 2012 n=1 | 2013 n=8 | 2014 n=8 | 2015 n=35 |
| Indigo Bunting | 0.26 | 0.71 | 0 | 0 | 0 | 0.20 |
| | 14 | 76 | 0 | 0 | 0 | 8 |
| Kentucky Warbler | 0.03 | 0 | 0 | 0 | 0 | 0.11 |
| | 3 | 0 | 0 | 0 | 0 | 8 |
| Mourning Dove | 0 | 0 | 1 | 0.03 | 0 | 0 |
| | 0 | 0 | -- | 12 | 0 | 0 |
| Northern Bobwhite | 0.03 | 0 | 0 | 0 | 0 | 0 |
| | -- | 0 | 0 | 0 | 0 | 0 |
| Northern Cardinal | 0.54 | 0.26 | 0 | 0.14 | 0.09 | 0.40 |
| | 40 | 17 | 0 | 74 | 25 | 42 |
| Northern Flicker | 0 | 0 | 0 | 0.03 | 0 | 0 |
| | 0 | 0 | 0 | 12 | 0 | 0 |
| Northern Mockingbird | 0 | 0.03 | 0 | 0 | 0 | 0 |
| | 0 | 3 | 0 | 0 | 0 | 0 |
| Northern Parula | 0.09 | 0.11 | 0 | 0 | 0 | 0.14 |
| | -- | 8 | 0 | 0 | 0 | 17 |
| Ovenbird | 0.03 | 0.06 | 0 | 0 | 0.03 | 0 |
| | -- | 3 | 0 | 0 | 12 | 0 |
| Pileated Woodpecker | 0.06 | 0.09 | 0 | 0.09 | 0.03 | 0.06 |
| | 6 | -- | 0 | 25 | 12 | 6 |
| Prothonotary Warbler | 0.03 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 0 | 0 | 0 | 0 | 0 |

Appendix A. Annual proportion of plots occupied (includes flyovers) by, and estimated abundance (determined using bird within 50-m of plot center) of breeding bird species at Lincoln Boyhood National Memorial, Indiana during the 2007 and 2011 through 2015 spring bird surveys.

| Common name | <u>Proportion of plots occupied</u> | | | | | |
|------------------------------|-------------------------------------|--------------|-------------|-------------|-------------|--------------|
| | Abundance | | | | | |
| | 2007 n=35 | 2011 n=35 | 2012 n=1 | 2013 n=8 | 2014 n=8 | 2015 n=35 |
| Red-bellied Woodpecker | 0.20 | 0.06 | 0 | 0.03 | 0 | 0.14 |
| | 8 | -- | 0 | 12 | 0 | 8 |
| Red-eyed Vireo | 0.09 | 0 | 0 | 0 | 0 | 0.20 |
| | 11 | 0 | 0 | 0 | 0 | 17 |
| Red-headed Woodpecker | 0.06 | 0 | 0 | 0 | 0 | 0 |
| | -- | 0 | 0 | 0 | 0 | 0 |
| Red-tailed Hawk | 0 | 0.03 | 0 | 0 | 0 | 0 |
| | 0 | 3 | 0 | 0 | 0 | 0 |
| Song Sparrow | 0 | 0 | 0 | 0.03 | 0 | 0 |
| | 0 | 0 | 0 | 12 | 0 | 0 |
| Sharp-shinned Hawk | 0.03 | 0.03 | 0 | 0 | 0 | 0 |
| | 3 | -- | 0 | 0 | 0 | 0 |
| Summer Tanager | 0.03 | 0.17 | 0 | 0 | 0 | 0.06 |
| | 3 | 6 | 0 | 0 | 0 | 3 |
| Tufted Titmouse | 0.31 | 0.34 | 0 | 0.20 | 0.14 | 0.40 |
| | 25 | 14 | 0 | 62 | 50 | 17 |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0.06 | 0 |
| | 0 | 0 | 0 | 0 | 12 | 0 |
| White-breasted Nuthatch | 0.17 | 0.06 | 0 | 0 | 0 | 0 |
| | 11 | 3 | 0 | 0 | 0 | 0 |
| White-eyed Vireo | 0 | 0 | 0 | 0 | 0 | 0.03 |
| | 0 | 0 | 0 | 0 | 0 | 3 |

Appendix A. Annual proportion of plots occupied (includes flyovers) by, and estimated abundance (determined using bird within 50-m of plot center) of breeding bird species at Lincoln Boyhood National Memorial, Indiana during the 2007 and 2011 through 2015 spring bird surveys.

| Common name | <u>Proportion of plots occupied</u> | | | | | |
|-------------------------|-------------------------------------|--------------|-------------|-------------|-------------|--------------|
| | Abundance | | | | | |
| | 2007 n=35 | 2011 n=35 | 2012 n=1 | 2013 n=8 | 2014 n=8 | 2015 n=35 |
| Wood Thrush | 0.11 | 0 | 0 | 0 | 0 | 0.14 |
| | 3 | 0 | 0 | 0 | 0 | 6 |
| Yellow-billed Cuckoo | 0.23 | 0 | 0 | 0 | 0 | 0 |
| | -- | 0 | 0 | 0 | 0 | 0 |
| Yellow-throated Vireo | 0.11 | 0.23 | 0 | 0 | 0 | 0.17 |
| | 8 | 14 | 0 | 0 | 0 | 11 |
| Yellow-throated Warbler | 0.03 | 0.03 | 0 | 0 | 0 | 0.03 |
| | 3 | 3 | 0 | 0 | 0 | 3 |
| Yellow Warbler | 0.03 | 0.11 | 0 | 0 | 0 | 0.11 |
| | -- | 6 | 0 | 0 | 0 | 8 |

* — denotes when a species was present on a plot but outside 100-m of plot center therefore their annual abundance value could not be calculated.

Bolded species names are those species considered of conservation concern for the Central Hardwoods Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

Appendix B.

Appendix B. Regional trends in breeding birds recorded on Lincoln Boyhood National Memorial (LIBO), Indiana for years 2007 through 2013.

| Common name | Trend | 95% Confidence Interval | |
|--------------------------|-------|-------------------------|-------|
| | | Lower | Upper |
| Acadian Flycatcher | 1.30 | -0.07 | 2.80 |
| American Crow | -0.51 | -1.89 | 0.78 |
| American Robin | 2.28 | 0.85 | 3.73 |
| American Woodcock | 3.00 | -11.84 | 28.95 |
| Baltimore Oriole | -0.07 | -3.85 | 3.50 |
| Blue-gray Gnatcatcher | 0.20 | -1.59 | 2.08 |
| Blue Grosbeak* | 2.09 | 0.01 | 4.24 |
| Blue Jay | -1.37 | -2.64 | 0.03 |
| Carolina Chickadee | -0.23 | -2.44 | 1.97 |
| Carolina Wren | 1.46 | -0.58 | 3.49 |
| Chimney Swift | -3.16 | -5.10 | -1.13 |
| Common Grackle | -2.81 | -4.24 | -1.31 |
| Downy Woodpecker | 2.00 | -0.70 | 4.91 |
| Eastern Bluebird | 2.29 | -0.23 | 4.86 |
| Eastern Phoebe | 0.43 | -1.61 | 2.52 |
| Eastern Towhee | -0.83 | -2.45 | 0.92 |
| Eastern Wood-pewee | -1.99 | -3.44 | -0.55 |
| Gray Catbird | -1.69 | -3.78 | 0.48 |
| Great Crested Flycatcher | -0.57 | -2.32 | 1.24 |
| Hairy Woodpecker | 1.81 | -1.07 | 5.23 |

Appendix B. Regional trends in breeding birds recorded on Lincoln Boyhood National Memorial (LIBO), Indiana for years 2007 through 2013.

| Common name | Trend | 95% Confidence Interval | |
|------------------------------|--------------|-------------------------|-------------|
| | | Lower | Upper |
| House Sparrow | -1.84 | -4.02 | 0.42 |
| House Wren | 0.50 | -2.75 | 3.63 |
| Indigo Bunting | -0.59 | -1.41 | 0.23 |
| Kentucky Warbler | -1.77 | -4.37 | 0.64 |
| Mourning Dove | 0.88 | -0.35 | 2.26 |
| Northern Bobwhite | -5.17 | -7.13 | -3.20 |
| Northern Cardinal | 0.19 | -0.65 | 1.05 |
| Northern Flicker | na | na | na |
| Northern Mockingbird | 3.93 | 2.22 | 5.69 |
| Northern Parula | 3.48 | 1.44 | 5.11 |
| Ovenbird | -3.00 | -6.78 | 0.70 |
| Pileated Woodpecker | 0.77 | -1.37 | 2.95 |
| Prothonotary Warbler | 1.21 | -2.68 | 5.85 |
| Red-bellied Woodpecker | 2.45 | 0.81 | 4.19 |
| Red-eyed Vireo | -0.59 | -2.14 | 0.91 |
| Red-headed Woodpecker | 1.48 | -2.38 | 5.66 |
| Red-tailed Hawk | -0.18 | -3.26 | 2.78 |
| Sharp-shinned Hawk | 2.89 | -5.61 | 13.00 |
| Song Sparrow | 0.35 | -2.06 | 2.72 |
| Summer Tanager | 0.27 | -1.37 | 1.90 |
| Tufted Titmouse | 2.98 | 1.08 | 4.95 |

Appendix B. Regional trends in breeding birds recorded on Lincoln Boyhood National Memorial (LIBO), Indiana for years 2007 through 2013.

| Common name | Trend | 95% Confidence Interval | |
|-------------------------|--------------|-------------------------|--------------|
| | | Lower | Upper |
| Turkey Vulture | 5.01 | 2.09 | 7.99 |
| White-breasted Nuthatch | -0.86 | -3.91 | 2.28 |
| White-eyed Vireo | -2.29 | -4.17 | -0.37 |
| Wild Turkey* | 11.12 | 2.76 | 18.50 |
| Wood Thrush | -3.85 | -5.90 | -1.89 |
| Yellow-billed Cuckoo | -3.20 | -6.15 | -0.03 |
| Yellow-throated Vireo | 2.37 | 0.27 | 4.77 |
| Yellow-throated Warbler | 3.08 | 0.19 | 5.38 |
| Yellow Warbler | -3.24 | -8.54 | 1.45 |

* Species recorded between point transects or other times outside of 5-min survey periods.

Bolded species names are those species considered of conservation concern for the Central Hardwoods Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

Regional trend data from BBS surveys (Sauer et al. 2014).

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National Park Service
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